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ON A COLLECTION OF COCCIDAE AND OTHER INSECTS
AFFECTING SOME CULTIVATED AND WILD PLANTS IN
JAVA AND IN TROPICAL WESTERN AFRICA.

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WITH PLATES III AND IV.

THE insects herein described and catalogued were collected by Dr. W. Busse, Regierungsrat, Kaiserliche Biologische Anstalt für Land-und Forstwirtschaft, Berlin.

The material was placed in my hands in January 1906, and the MSS. and drawings practically completed shortly afterwards; but owing to other pressing matters I was compelled, much to my regret, to lay the work aside and I have only just been able to revise and complete it.

I take this opportunity of tendering to Dr. Busse my most sincere apologies for the long and unavoidable delay, and beg that he will accept my sincere thanks for giving me the opportunity of examining this interesting collection of insects.

Fam. COCCIDAE.

Aspidiotus destructor, Signoret.

Ann. Soc. Ent., Fr. (1869), (4), ix, p. 120.

Habitat.—On the leaves of the Cocoa-Palm (*Cocos nucifera*, Linn.), Lome, Togo, xi, 05 (No. 3675). On *Calophyllum inophyllum*; Atakpome, Togo, x, 01 (No. 3673). On Coco-nut leaves, Kpeime, Togo, i, 05 (No. 3676).

Dr. Busse informs me that this insect causes great harm to the coco-nut plantations in Togo, causing the infested leaves to become yellow and dry.

[Journ. Econ. Biol., 1908, vol. iii, No. 2.]

It is generally a destructive species especially so in the West Indies. It occurs also in China, Formosa, India, Laccadive Islands, Bourbon Island, Mauritius, Demerara, and Mexico, and has also been recorded from other parts of Africa.

Palms of various kinds are its favourite food-plants, but it is a general feeder and among a number of plants I may mention, Mango (*Mangifera indica*), Banana, Nutmeg (*Myristica fragrans*), *Celtis occidentalis*, *Terminalia catappa*, etc.

Larvae and adults of two species of *Coccinellidae* of the genus *Chilocorus* were associated with the coccid; the one with a red head, black thorax, and red discoidal patch on the elytra is allied to *C. discoidens*; the other with a red head and thorax and red at the base and apex of the elytra is probably undescribed. These beetles and their larvae had destroyed between 80 and 90 per cent. of the coccids, so that their presence must have been extremely beneficial.

Aspidiotus? sp.

Habitat.—On an unknown shrub; Amussukovhe, Togo, 10.ii.04 (No. 3322).

These examples were so badly infested with a pale orange fungus as to render the coccids quite undeterminable. A similar fungus is known to attack two species of *Diaspinæ* in Central Africa.

Aulacaspis cinnamomi, n.sp.

Pl. III, figs. 1-3.

Female puparium approximately circular, low convex or flat, thin and often wrinkled; opaque white with a faint tinge of greenish-yellow giving it a somewhat wax-like appearance, but this character is not always evident; pellicles translucent, dusky ochreous, with a median ridge of black forming a distinct median line.

Length, 1.25-2; greatest width, 1.75-2 mm. Male puparium strongly tricarinate, normal.

Adult female (Pl. III, fig. 1) very elongate with the cephalo-thoracic area nearly as broad as long, posterior angles almost right angles, sides almost straight as far as the large thoracic tubercles. Abdominal segments strongly produced. Pygidium (figs. 2, 3) with one short irregular series of 4 dorsal glands, and an isolated pair in the region of the articulation of the abdomen with the pygidium; circumgenital glands in five groups: median group of about 15, upper laterals 16-19, lower laterals 16-17; median lobes widely divergent tips free, edges and tips serrated; second and third lobes duplex,

outer lateral edges faintly serrated, the lower lobule of the third pair is sometimes divided at the lower margin; the six bilateral squames are simple; the marginal pores are seven in number, the subcutaneous tubes of which become shorter as they approach the first free abdominal segment.

Habitat.—On *Cinnamomum ceylanicum* (seedling plants); Molio-artijo, East Java, 7.1.03 (No. 1784). Also on an unknown shrub in the forest near Smeroe (Casuarinen Region); about 1,800 m. (No. 1788).

***Aulacaspis javanensis*, n.sp.**

Pl. III, figs. 4-6.

Female puparium approximately circular, flat or low convex, smooth and wax-like and somewhat opaque; larval exuviae marginal, pale fulvus.

Length, 1.50-2 mm; greatest width, 1.50-2 mm. Male puparium white and strongly tricarinate.

Adult female (fig. 4) very elongate, highly chitinated; cephalothorax nearly as broad as long, posterior angles broadly rounded (in well restored specimens), free abdominal segments broad and strongly produced at the sides. Pygidium (Pl. III, figs. 5, 6) with *three continuous series of dorsal glands*, the second and third series extending into the succeeding segment of the abdomen; circumgenital glands in five almost continuous groups, the anterior group of 15-16, the anterior laterals from 18-22; median lobes widely divergent, apices free, inner margin curved outwards and finely serrated; second and third lobes duplex, small; third pair often obscured by the thickened apex of a projecting marginal pore; squames 7-8 in number, simple, and there are 4-5 on the adjacent segment; marginal pores 8-9, a few small ones also occur on the rudimentary and two succeeding segments of the abdomen.

Habitat.—On Ericaceae (?) and two undermentioned shrubs. Forest on the mount Smeroe, East Java, about 1800 m., 7.1.03 (Nos. 1785, 1786), also on an aquifoliaceous shrub. Forest on the Smeroe, 7.1.03 (No. 1789) and in Bamboo-wood on the Smeroe, 14.1500 m., 7.1.03 (No. 1790).

***Florinia diasporiformis*, n.sp.**

Pl. III, figs. 7-10.

Female puparium purple brown or smoky brown, margins paler; *secretional margin unusually wide*, often considerably wider than the

length of the nymphal pellicle; pellicles pale yellowish-brown, terminal secretory covering smoky brown. Form somewhat irregular, usually broadly pyriform, but some examples have a tendency to become more or less circular.¹ Ventral pellicle complete, thin anteriorly, thick posteriorly; colour smoky grey.

Length, 1.75-2.75 mm., width, 1.50-2 mm.

Male puparium white, thickly felted and very strongly tricarinate; pellicle yellowish-brown.

Length, 1 mm.

Adult female oviparous; not highly chitinised; ovate, with the margins of that free abdominal segments strongly defined; cephalo-thoracic area distinctly divided. Rostral filaments² two and a half to three times the length of the body.

Rudimentary antennae placed closely together near the anterior margin, each furnished with a single, long curved spine. Parastigmatic glands arranged in a compact group, anteriorly. Anal orifice immediately below the anterior group of circumgenital glands. Pygidium (Pl. III, figs. 7, 8) somewhat produced; median lobes small approximate, margins strongly dentate; lateral lobes small, entire, the first sometimes spatulate; synemes large, four on either side, and there are three or four on each of the succeeding abdominal segments; spines minute; the first three or four pairs of marginal pores with more or less angular projections, the rest not so, and they extend into the cephalo-thoracic area. Circumgenital glands in five groups; median with 10-11; upper laterals with 22-28; lower laterals with 16-27. Dorsal pores in three continuous series, the third following the line of the succeeding segment.

Second Stage Female (Pl. III, fig. 9) much more elongate than the adult female. Margin of pygidium (Pl. III, fig. 8) closely resembling that of the adult, but the lateral lobes are either quite rudimentary or entirely absent, and there are only four bilateral marginal pores, forming angular or rounded projections.

The female puparium superficially resembles certain forms of *Aulacaspis* due to the abnormally large supplementary secretion. The other distinguishing feature is the enormously long rostral filaments.

Habitat.—On *Piper* sp.; Bamboo-wood on the Smeroe, East Java, about 1,500 mm., 7.1.03 (No. 1787).

¹ These forms are apparently immature.

² These organs become detached almost invariably in the process of removal from the food-plants.

Chionaspis (Hemichionaspis) aspidistraevar. *gossypii*, n. var.

Female puparium. Form resembling typical examples of *C. aspidistrae*, being elongate and widened posteriorly but with little tendency to become curved or mytiliform. Colour pale ochreous; texture rough owing to a scanty, superimposed, layer of red-brown bark fibres being incorporated with the secretionary matter; pellicles darker than the rest of the puparium.

Length, 2-2.50 mm.

The adult females are slightly larger than typical examples found under glass in Europe; but structurally they are practically identical.

The examples submitted for examination almost covered the bark of the small branches, and must therefore have caused some injury to the plant.

Habitat.—On *Gossypium hirsutum*; Kpeme, Togo, i.05 (No. 3678).

Mytilaspis (Lepidosaphes) ? sp.

Habitat.—On *Terminalia catappa*, Buitenzorg, Java; xii.02 (No. 1701).

Three female puparia in association with *Parlatoria proteus* and a species of *Aleurodes*. The material was not sufficient for diagnostic purposes.

Parlatoria proteus, Curtis.

Gardener's Chronicle (1843), p. 676.

Habitat.—On *Terminalia catappa*; Buitenzorg, Java; xii.02 (No. 1701). This species was found in association with *Aleurodes* sp. and *Mytilaspis* sp. Not hitherto recorded from Java; but this insect is very widely distributed throughout the world.

Dactylopius coffeae, n.sp.

Pl. III, figs. 14-16.

Adult female covered with densely felted plates of white secretion, but this covering was so much injured as to render it impossible to give a correct description of its arrangement. Form rather short, ovate. Antenna (Pl. III, figs. 14, 14a.) long, setose, of eight segments, terminal segment much the longest and some of the hairs upon it are longer and stouter than the rest. Legs normal. Margins with an equidistant series of spines (Pl. III, fig. 9) usually in pairs, each surrounded by a group of rather large spinnerets. Dermal spinnerets minute; spines few and scattered. There are two pairs of large

ventral glands (Pl. III, 16), the first pair are placed near the margin immediately below the insertion of the antennae, the other pair also submarginal, are situated a little anterior to the anal opening; each gland has a long transverse slit and a bilateral lunular patch of chitine thickly studded with spinnerets and minute hairs. Anal orifice with six hairs. Anal lobes normal, each with a few short spine-like hairs and a single long stout hair.

Habitat.—On Liberian coffee; Java, 7.i.03 (No. 1791).

This species may be distinguished chiefly by the densely felted plates of white secretion which cover the dorsum.

In the form of the waxy covering it resembles *D. nipae*, but it is a much larger insect.

***Ceroplastes theobromae*, n.sp.**

Test of adult female reddish pink, darker in old examples, nucleated; margin with two large bilateral, stout, white appendages; caudal process uncovered at the tip; posterior extremity with two large mammiiform swellings.

Length, 4.5; width, 3.50-4.75 mm.

Adult female. Dermis smooth, shining, highly chitinated; cephalic area clypeate; caudal process short. Antennae of six segments of which the third is slightly longer than all the succeeding segments together; fourth and fifth shortest and together equalling the length of the seventh. The three terminal segments are deeply constricted and so also is the third near the distal extremity. Stigmatic clefts deeply emarginate; spines obconical and short.

Habitat.—On Cocoa; Soppo, Cameroon, 3.iii.05 (No. 3661a); Bamba, Cameroon, ii, 05 (No. 3661).

***Lecanium hesperidum* var. *javanensis*, n.var.**

Pl. III, figs. 11-13.

Adult female elongate or sub-pyriform, dorsum with a distinct longitudinal keel or ridge; abdominal area with a series of irregular rugose carinae. Colour dusky brown, margins paler. Antenna (Pl. III, figs. 11, 11a) of seven segments. Marginal spines (Pl. III, fig. 12) minute, curved and finely divided at the tips.

Habitat.—On Liberian coffee; Molio-ardjo, East Java, 7.i.3 (No. 1791).

This insect occurred in association with *Dactylopius coffeae*. It differs from typical *hesperidum* by the much smaller marginal spines and the sculpture of the dorsum.

All the specimens were attacked by a fungus on the venter from which it spread outwards, forming a regular and complete fringe all round the margin of the insect. So conspicuous was this fringe that I at first mistook it for a natural fringe of the insect, but on closer examination each filament composing the fringe was found to consist of a mass of delicate mycelia. There was no trace of the fungus in the body cavity but the whole of the venter was covered by a thick layer of mycelial threads, which had, in all probability, destroyed the insects.

Habitat.—On Liberian coffee; Molio-ardjo, East Java, 7.i.03 (No. 1791).

Hemilecanium, n.g.

Pl. IV, figs. 1-11.

Adult female with the posterior extremity *not cleft*. Anal orifice placed near the middle of the dorsum and closed above with a pair of hinged plates as in *Lecanium*. Larva and nymph with a distinct anal cleft as in *Lecanium*. Female in all stages with four large dorsal groups of compound spinnerets.

Hemilecanium theobromae, n.sp.

Adult female (Pl. IV, fig. 1) broadly ovate or sub-circular; margins broadly flat, central area suddenly elevated, with strong irregular prominences. The whole of the dorsal area covered with a thin but dense layer of ochreous meal-like wax, but the prominences of the dorsum are generally denuded, apparently through abrasion, appearing through the secretion as shining, piceous, irregularities. Cuticle shining dark piceous on the central elevated area; dark castaneous and strongly rugose at the margins. Venter covered with a rather thick layer of white fibrous secretion. Anal cleft obsolete, but there is usually a faint emargination at the posterior extremity. Anal orifice placed just within the broad elevated dorsal zone at about one-third of the distance from the posterior margin. Derm cells of two distinct types; those of the dark central area (Pl. IV, fig. 5) narrowly elongate with an apical pore, those of the pale broad margin of the ordinary polygonal type (Pl. IV, fig. 6). There are also four groups of spinnerets: two towards the anterior and two towards the posterior extremity, each group composed of several hundred spinnerets forming well defined dark chitinated areas. Antenna (Pl. IV, fig. 2) of the nine segments, of which the third is the longest; there are a few long hairs on the four terminal segments; formula 3, 4 (5, 2, 9) 6, 1 (7, 8) Legs (Pl. IV, fig. 3) highly

chitinised; slender but small compared with the size of the insect; *coxa almost equalling the length of the femur*; digitules simple. Marginal spines (Pl. IV, fig. 4) with their broad bases suddenly contracted each fitting into a well-defined socket, the latter being attached to a short subcutaneous tube. Stigmatic channels and spines absent.

Length, 13-15 mm.; width, 12-13 mm.

Second Stage Female (Pl. IV, fig. 7) broadly ovate, slightly narrowed posteriorly, marginal spines continuous resembling those in the adult. Antennae of seven segments, the third being the longest, the rest of the segments subequal in length. Legs scarcely longer than the antennae; coxa rather broad. Mentum uniaarticulate. Groups of spinnerets (Pl. IV, fig. 8) occupying relatively the same position as in the adult, but there are only about 60-70 individual spinnerets in each group; they are also larger and more distinctly separated than in the adult. Derm in the region of the anal cleft finely squamose, with a large subcutaneous tube (Pl. IV, fig. 9); there is also a similar tube just within the margin opposite the anterior stigmata.

Larva (Pl. IV, fig. 10) elongate; position of the compound spinnerets as in the adult and nymph. Mentum monomerous. Antenna (Pl. IV, fig. 11) of six joints, the third equalling the length of the fourth, fifth and sixth together. Marginal spines forming a continuous series.

Habitat.—On the stems of the Cacao (*Theobroma cacao*); Soppo, Cameroon, W. Africa, March, 1905 (No. 3677).

This is an extremely interesting and highly protective species, and is also one of the largest members of the *Lecaniinae*; but although so large it is a very inconspicuous insect as the irregular prominences of the dorsum, together with its mealy covering so exactly harmonises with the colour of the bark on which it rests that it is difficult, in many instances, to see where the insect ends and where the bark begins. If I translate Dr. Busse's notes correctly he says "this insect imitates little bosses or excrescences on the bark of the cocoa stems, and so deceptively in shape and colouring that it requires some experience before you can recognise the animals as such."

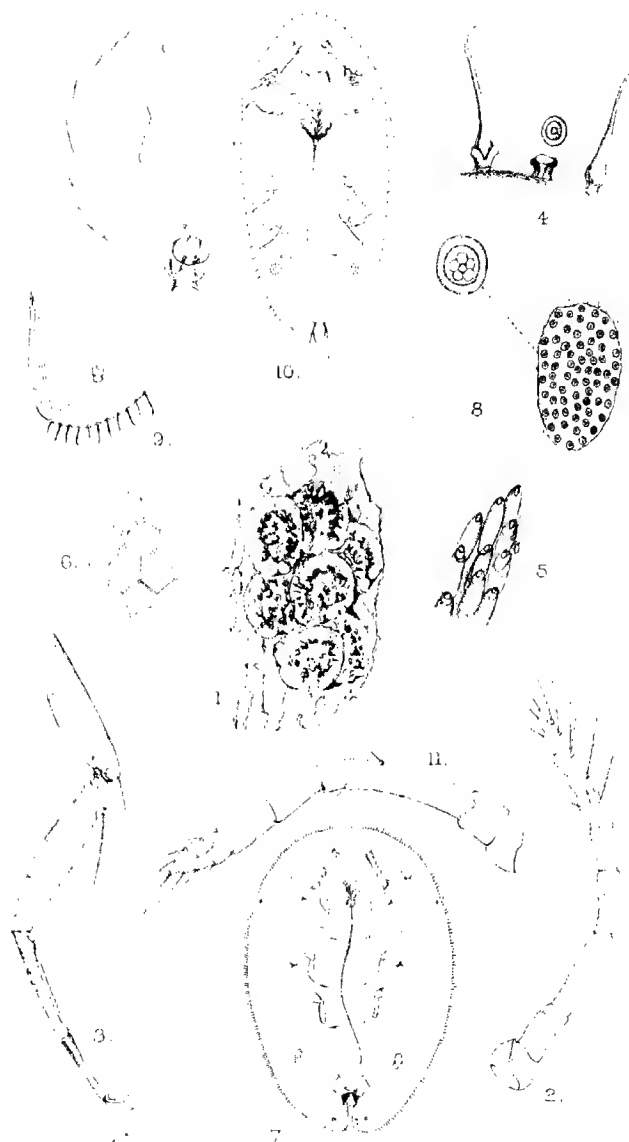
***Stictococcus sjostedti*, Cockerell.**

Canadian Ent. (1903), xxxv, p. 64.

Habitat.—On the fruit and fruit-stalks of the Cacao; Victoria, Cameroon; ix.04. (Nos. 3169, 3189).







1. Hemilecanium theobromae

2. Hemilecanium theobromae

HEMILECANIUM THEOBROMAE n. sp.

Since its discovery by Dr. Sjöstedt in 1903, this insect has been found in several other localities along the West Coast of Africa; but it has not been recorded from any other part of the world. From information recently obtained one gathers that this insect is one of the recognised cocoa pests in Western Africa.

Fam. ALEURODIDAE.

Aleurodes? sp.

Habitat.—Java on *Terminalia catappa*; Buitenzorg, Java, (No. 1701). Associated with *Parlatoria proteus* and the *Mytilaspis*. The leaves were almost covered with this insect, but they were not sufficiently well preserved to enable one to determine them specifically.

Fam. PSYLLIDAE.

Psylla, sp.

Habitat.—On *Kickxia elastica*; Soppo, Cameroon (No. 3674).

This insect produces a deep ovate depression on the underside of the leaf with a corresponding raised, tubercular, swelling on the upper surface. They were packed so closely together that the leaves, from the innumerable pits and swellings, presented a most remarkable appearance.

The examples (No. 3674) sent in the first instance consisted of larvae and pupae, and as it was not possible to determine the insect from the material, Dr. Busse very kindly obtained a further supply of the infested leaves. On examining these I was disappointed to find that the few winged forms which were present were all so damaged as to render them quite useless. This insect is of considerable economic importance, so that further endeavours should be made to obtain perfect examples of the adult.

EXPLANATION OF PLATES III AND IV.

Illustrating Mr. Robert Newstead's paper on "A Collection of Coccidae and other Insects affecting some cultivated and old plants in Java and in tropical Western Africa."

PLATE III.

Aulacaspis cinnamomi, n.sp.

Fig. 1.—Adult female (enlarged).

Fig. 2.—Pygidium of do. × 250.

Fig. 3.—Margin of pygidium. × 600.

***Aulacaspis jarvanensis*, n.sp.**

Fig. 4.—Adult female (enlarged).

Fig. 5.—Pygidium of adult female. $\times 250$.Fig. 6.—Margin of pygidium. $\times 600$.***Florinia diaspidiformis*, n.sp.**Fig. 7.—Pygidium of adult female. $\times 250$.Fig. 8.—Margin of pygidium of adult female. $\times 600$.Fig. 9. Margin of pygidium of second stage female. $\times 600$.

Fig. 10. Adult lying within the moulted skin of the second stage female (enlarged).

Lecanium hesperidum* var. *jarvanensis*, n. var.**Fig. 11, 11a. Antennae of adult female. $\times 250$.Fig. 12. Marginal spines of adult female. $\times 600$.Fig. 13. Stigmatic spines of adult female. $\times 250$.Dactylopius coffeae*, n.sp.**Fig. 14, 14a.—Antennae of adult female. $\times 250$.Fig. 15.—Portion of epidermis (with glands and spines) of adult female. $\times 600$.Fig. 16.—One of the large glandular orifices of adult female. $\times 120$.

PLATE IV.

***Hemitecanium theobromae*, n.sp.**

Fig. 1.—Group of adult females (natural size).

Fig. 2.—Antennae of adult female (enlarged).

Fig. 3.—Leg of adult female (enlarged).

Fig. 4.—Marginal spines of adult female. $\times 250$.Fig. 5.—Derm cells of the dark central area of dorsum. $\times 350$.Fig. 6.—Derm cells of the marginal area. $\times 250$.

Fig. 7.—Second stage female (enlarged).

Fig. 8.—Group of compound spinnerets. $\times 130$, about.Fig. 9.—Right portion of the anal extremity of the nymph showing the squamose character of the dermis, and the curious secretory gland ($\times 600$).

Fig. 10.—Larva (enlarged).

Fig. 11.—Antennae of the larva. $\times 250$.

ON AN ENCHYTRAEID WORM INJURIOUS TO THE SEEDLINGS OF THE LARCH.*

By

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WITH PLATE V.

WHEN the seedlings of the larch attain the age of about 12-14 months they are frequently attacked by a small white worm, and the presence of such a pest in a nursery is readily discernable by the dead and withered appearance of the plants.

I find on inquiry that the killing off of the seedlings is attributed by foresters and nurserymen to the presence of "a worm," but the character of the worm when it is specified is usually incorrect, some calling it a "wire-worm" and others an "eel-worm." Last year I was able to examine some larch-seedlings in nurseries at Thirlmere (Cumberland) and found that the worm which was responsible for the damage was neither a wire-worm nor an eel-worm, but differed from each of these by as much as they differ from each other. It proved to be a small white Oligochaet worm, belonging to the family *Enchytraeidae*, and Mr. F. E. Beddard very kindly identified it for me as *Fridericia bisetosa*, Levinsen.

The *Enchytraeidae* form a compact and easily separable family of the Oligochaet worms, which is of course of economic interest on account of the phytophagous habits of some of its members. They not only feed on decaying vegetable matter, but also on living plants, in which cases, as in the present, they sometimes become seriously injurious.

Theobald (1906) records specimens of *Enchytraea* worms being sent as eel-worms from Hastings, where they occurred in such substances as rotten leaves and road-scrapings, and also in old horse-dung; they were also found in flower beds containing roses and pansies.

The *Enchytraeidae* are small worms ranging, according to Beddard (1895) from 3 mm. to 40 mm. in length. All possess a prostomium.

* Read before the Association of Economic Biologists, Edinburgh Meeting, July 28th, 1908.

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The members of the germs *Fridericia*, to which this worm belongs, are chiefly characterised by the possession of dorsal pores: they are also distinguishable in the characters of their setae. Beddard (*l.c.*) states that they are developed in each bundle two at a time, the newly-formed pair lying between the older pair, and the next pair between these, and so on, so that in a group of setae the outermost are the oldest and the innermost are the youngest setae. In this species *F. bisetosa* the older pair usually falls out before the younger ones are formed, so that, as the name implies, the worm has only two setae in each bundle. This, however, is not always the case in *F. bisetosa*, and my observations confirm those of Ude, who found that in immature individuals four setae occur in each group, the older outer pair not having fallen out; I find this to be the case in mature specimens also, and a group of these setae are shown in fig. 3.

Fridericia bisetosa, Levinsen, is defined by Beddard as follows:—

“Length, 20 mm.; number of segments, 60; setae paired; Anteseptal region of nephridium nearly equal to post-septal, with undulating duct. Spermathecae with two diverticula.”

The worms are white and at first sight have an appearance rather similar to Nematodes, but on a closer examination their real nature is soon perceived. This species is further characterised anatomically by the fact that the brain is about twice as long as broad, and its posterior border is either straight or slightly concave. The dorsal vessel arises in the 18th segment. The vasa deferentia are long and coiled, and their funnels are twice as long as broad; the spermiducal glands are well developed.

This pest does not appear to attack larches that are more than twelve or fourteen months old. The signs of the attack are a gradual shrivelling up of the whorls of young green leaves, which is followed by a withering of the upper portion of the young seedling as it is gradually killed. If such seedlings are pulled up or, better, carefully dug up, the small white worms, measuring about three-quarters of an inch in length, will be found round the main root and in the earth surrounding it. The injury is done to the root beneath the ground: the cortical tissue is destroyed, as shown in the figure, leaving the central woody cylinder exposed. This radical decortication is fatal to the young plants and they soon die.

Worms of this nature, as Theobald (*l.c.*) has also shown, can be destroyed by means of carbon-bisulphide. On the appearance of this worm in the larch nurseries the method of treating the seedlings which I should suggest would be to inject the carbon-bisulphide by

Fridericia bisetosa DC.



FRIDERICIA BISETOSA.

means of a Vermorel or other suitable injector. The injections should alternate on the two sides of each row of seedlings, each injection being about six or eight inches from the row, and stopping obliquely towards the row. So that the volatilising carbon-bisulphide may rise to the roots. The injection must be made deep enough to prevent the liquid touching the roots of the seedlings, and the injections of each side of the row should be about two feet apart. The carbon-bisulphide should only be injected when the soil is dry, otherwise it will not be able to reach the worms at the roots of the seedlings when it volatilises. From a quarter of an ounce to half an ounce, or nine to eighteen grammes, will be sufficient for each injection.

REFERENCES.

895. **Beddard, F. E.**—"A Monograph of the Order Oligochaeta." 769 pp. (Oxford, Clarendon Press.)
906. **Theobald, F. V.**—"Report on Economic Zoology for the year ending April 1st, 1906." *Journal of the South-Eastern Agricultural College, Wye, Kent.* pp. 29-140.

EXPLANATION OF PLATE V.

Illustrating Mr. C. Gordon Hewitt's paper "On an Enchytraeid Worm injurious to the Seedlings of the Larch."

- Fig. 1.—Larch seedling, twelve months old, showing the appearance of the root and shoot of a seedling killed by *F. bisetosa*.
- Fig. 2.—*Fridericia bisetosa*, Levinsen.
- Fig. 3.—Single Group of setae of *F. bisetosa*, showing the outer and o... setae remaining after the appearance of the inner younger setae.

A NOTE ON THE FLIGHT OF THE EARWIG,
FORFICULA AURICULARIA, LINN.

By

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THE wings of earwigs have long been a subject of interest amongst zoologists, both on account of their actual structure, and also the complex manner in which they fold them up when in repose.

Almost every writer on the *Forficulidae* has drawn attention to the fact that a large number of species of the family have the wings undeveloped, or they are folded in a complex manner, similar to the species under consideration.

In spite of the complexity of the wings in the common earwig, it is generally supposed that they are seldom used. Dr. Sharp¹ writes: "It is quite a mystery why earwigs should fold their wings in this complex manner, and it is still more remarkable that the Insects very rarely use them. Indeed, though *Forficula auricularia* is scarcely surpassed in numbers by any British Insect, yet it is rarely seen on the wing; it is probable that the majority of the individuals of this species may never make use of their organs of flight or go through the complex process of unfolding and folding them."

During the latter part of June and early in July I heard numerous complaints of the enormous number of these insects, which were committing serious damage to garden plants and invading houses in large numbers.

Quite unaware of the rarity of the occasion, a friend remarked to me that they had frequently flown through the open window in an evening, and when I remarked that they were seldom known to fly, he advised me to throw open my window between 9 and 10 p.m.

For three consecutive evenings I opened two casement windows between 9.30 and 10.30, with the following result:—On the first evening eight earwigs entered the room in flight, on the second evening eleven, and on the third evening seven.

¹ Insects, Camb. Nat. Hist., 1901, vol. i, p. 207.

In nearly all cases they came through the window and flew to the right or left of the room, evidently to avoid the gas, but on two occasions they passed over the gas and settled on the picture moulding opposite to the window.

An examination of the 26 specimens revealed the significant fact that they were all males.

If within the space of one hour an average of 9 insects flew into my room, it seems only reasonable to suppose that there were many more on the wing out of doors.

I am aware that they have previously been recorded in flight,¹ but I think there must be certain conditions that are conducive to this habit.

The three evenings I mention were very warm, calm, sultry ones, and fairly dark. In any case the phenomenon is sufficiently rare to be worthy of placing on record.

Since the above was written a case has come under my observation of where in the open daylight a specimen flew in at the window of an office, settled on an open book, and the process of folding the wings was carefully noted by the observer; also a further case where one was knocked off a person's coat, and instead of falling to the ground immediately took to flight.

¹ See Theobald, *Entom. Mon. Mag.*, 1896, vol. vii (2nd Ser.), p. 60.

REVIEWS AND CURRENT LITERATURE.

I.—GENERAL SUBJECT.

Burgess, A. F.—Uniform Common Names for Insects. *Journ. Econ. Entom.*, 1908, vol. i, pp. 209-213.

A very useful list, but we do wish that American Economic Entomologists would not use the term "worm" for larva or caterpillar.

De Vries, Hugo.—Plant Breeding. Comments on the Experiments of Nilsson & Burbank. Pp. xv + 360, 114 figs. London: Kegan Paul, Trench, Trübner & Co., Ltd 1907. Price 7s. 6d.

In the author's words the main aim of these Essays is to give proof of the assertion that "Hybridization is the scientific and arbitrary combination of definite characters. It does not produce new unit-characters; it is only the combination of such that are new. This far-reaching agreement between science and practice is to become a basis for further development of practical breeding as well as of the doctrine of evolution."

The appreciation of such investigations as are here set forth must soon change the whole aspect of agricultural plant breeding, and consequently such a work as that before us is full of interest to the practical breeder as well as the student of plant evolution.

All who have studied the work of De Vries know how such has materially modified our views as to the origin, selection and adaptation of species, and these facts are in these essays brought home to one with a force that compels recognition.

After a brief introductory chapter on Evolution and Mutation, the author discusses in detail the work of Hjalmar Nilsson and that of Luther Burbank, sandwiching in between these a most lucid and fascinating chapter on Corn Breeding. In the two concluding chapters the association of characters in plant-breeding is fully discussed, and more briefly, the geographical distribution of plants.

Corn breeding, we are informed, is a new industry, hardly older than ten years, but it has developed at once on a commercial scale. Experience

proves it to be highly profitable, and the conviction is rapidly spreading that no corn grower can afford to be ignorant of its principles and its results.

We heartily commend the book to all who take an intelligent interest in plant breeding.

W. E. C.

Forel, Auguste.—*The Senses of Insects.* Translated by Macleod Yearsley. Pp. xv + 321, pls. 1, 2. London: Methuen and Co., 1908. Price, 10s. 6d.

Biologists, and entomologists in particular, are under a debt of gratitude to Mr. Macleod Yearsley for the English translation of Dr. Forel's fascinating work. As he justly remarks the work is but little known in this country, is full of interesting experimental details, and exhibits such a wide field of painstaking investigation that it only requires translation to find a considerable number of readers in this country.

So much that is worthless has been written upon the senses of insects, or perhaps we should say the supposed senses, that one turns to the present work with a feeling of relief and with a knowledge that the subject is being dealt with by a masterly mind and in a logical, fair, and open-minded manner.

It is not our intention to attempt any detailed criticism, but we cannot refrain from stating that a careful perusal of this book has only whetted our appetite for more such observations, and at the same time afforded a pleasure not realized since we read Semper's "Animal Life" and Lubbock's "Senses, Instincts, etc., of Animals."

It is a book to read and think over, and to all who have the slightest interest in the ways of insects our advice is "get it at once."

W. E. C.

Gamble, F. W.—*Animal Life.* Pp. xviii + 305 and 62 figs. London: Smith, Elder and Co., 1908. Price 6s. net.

There has recently been published quite a number of delightfully written works on animal life, unfortunately, however, the value of many of these is considerably mitigated by the many misstatements of fact, inaccurate observation and careless compilation. Dr. Gamble's book differs from such works in that it is most carefully compiled, full references being given to authorities, and free from the other blemishes just referred to.

Throughout the three hundred pages there is exhibited a freshness and lucidity of expression that cannot fail to impress the reader and excite his interest.

It is a book that all interested in animal life may read with pleasure and

profit, and it might with advantage find a place in every college and school library.

The weakest point of the work, if it has one, is the illustrations, which are unworthy of the text.

W. E. C.

Hinds, W. E. and Bishopp, F. C.—A Key suggested for the Classification of Entomological Records. *Journ. Econ. Entom.*, 1908, vol. i, pp. 91-102.

Isaac, J.—Entomology in Outline. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 35-154, 1 plt. and 111 text figs.

This excellent introduction to entomology has been written in the simplest manner, in plain, everyday language, divested so far as possible of all scientific and technical terms. It is intended for the horticultural commissioners, fruit-growers, and farmers, and is in no sense offered as a scientific dissertation on entomology.

The author has fulfilled a by no means easy task in an admirable manner, which cannot fail to be fully appreciated by those for whom it is intended.

W. E. C.

Knuth, P.—Handbook of Flower Pollination. Translated by J. R. Ainsworth Davis, vol. ii, pp. viii + 703, and 210 text figs. and 1 portrait. Oxford: The Clarendon Press, 1908. Price 32s. 6d. net.

We extend a hearty welcome to the second volume of this most interesting and valuable work. It is a veritable mine of information of interest alike to the botanist and entomologist, while it bristles with points of general biological interest.

The present volume deals with fifty-six natural orders.

The information given is concise but sufficiently full when read in conjunction with vol. i.

The whole subject of flower pollination is one of such immensity and so closely allied to other equally fascinating biological phenomena, that we dare not attempt any lengthy review, even did space permit or were we capable of such, for a work of this character speaks for itself, and must find a place and a welcome wherever biological problems are studied or taught.

W. E. C.

Massee, G. & Theobald, F. V.—The Enemies of the Rose. Pp. 84, 8 col. pls. and 5 figs. National Rose Society. [1908].

This little handbook is conveniently divided into two parts, viz., one, written by Mr. Massee, treating of the Diseases caused by Fungi, and another on Insect Enemies for which Mr. Theobald is responsible.

In 18 pages Mr. Massee has given a valuable and admirably condensed account of the different fungi attacking the rose, together with the preventive and remedial treatment. The description is well illustrated by four coloured plates showing the appearance of different diseases.

Mr. Theobald's account of the insect enemies of the rose is just as prolix as Mr. Massee's is brief, whilst many of the insects enumerated are scarcely what the rose grower regards as enemies, for the simple reason that he seldom, if ever, is troubled with them.

The remedies suggested are not always the happiest. The writer has more than once ruined beautiful plants by using quassia for greenfly, and has also seen great mischief wrought by the use of arsenate of lead on roses.

Such remedies are behind the times and belong to a day when rule of thumb culture obtained, happily they are now things of the past to the intelligent and up-to-date rose grower.

The "General Account of Insects" might have been omitted with advantage, whilst some reference to the authorities from whom Mr. Theobald has collated his facts would have been valuable.

L. G.

II.—ANATOMY, PHYSIOLOGY, AND DEVELOPMENT.

Effenberger, W.—Die Tracheen bei *Polydesmus*. Zool. Anz., 1897, Bd. xxxi, pp. 782-786, 4 figg.

Enderlein, G.—Über die Segmental-Apotome der Insekten und zur Kenntnis der Morphologie der Japygiden. Ibid., pp. 629-635, 8 figg.

Haller, B.—Über die Ocellen von *Periplaneta orientalis*. Ibid., pp. 255-262, 4 figg.

Hirschler, J.—Über leberartige Mitteldarmdrüsen und ihre embryonale Entwicklung bei *Donacia*. Ibid., pp. 766-770, 4 figg.

Holmgren, N.—Zur Morphologie des Insektenkopfes. Ibid., Bd. xxxii, pp. 73-97. 11 figg.

Imms, A. D.—Notes on the Structure and Behaviour of the Larva of *Anopheles maculipennis*, Meigen. Proc. Camb. Phil. Soc., 1907, vol. xiv, pp. 292-295.

Shafer, G. D.—Histology and Development of the Divided Eye of Certain Insects. Proc. Washington Acad. Sci., 1907, vol. viii, pp. 459-486, 4 pls.

- Wassilleff, A.—Die Spermatogense von *Blatta germanica*. Arch. mikr. Anat., 1907, Bd. lxx, pp. 1-42, T. i-iii, 1 fig.
- Zavrel, J.—Die Augen der Dipterenlarven und-Puppen. Zool. Anz., 1907, Bd. xxxi, pp. 247-255, 13 figg.
- Ziegler, H. E.—Die Tracheen bei *Iulus*. Ibid., pp. 776-782, 3 figg.

III.—GENERAL AND SYSTEMATIC BIOLOGY, AND GEOGRAPHICAL DISTRIBUTION.

- Banks, N.—A Revision of the Ixodoidea, or Ticks of the United States. U.S. Dept. Agric., Bur. of Entom., Tech. Ser. No. 15, 1908, pp. 1-61, pls. i-x.

A valuable paper to students of the Ixodoidea generally. The author records 38 species and 3 unplaced forms.

- Bayer, É.—Notes sur les Galles de *Dryophanta agama* et *disticha* de l'iconographie "Galles de Cynipides." Marcellia, 1908, vol. vii, pp. 3-9, figs. 1-6.

- Bezzi, M.—Noterelle cecidologiche. Marcellia, 1908, vol. vii, pp. 10-13.

- Brues, C. T.—The Correlation between habits and structural characters among parasitic Hymenoptera. Journ. Econ. Entom., 1908, vol. i, pp. 123-128.

- Brunetti, E.—Revision of the Oriental *Stratiomyidae*. Rec. Indian Mus., 1907, vol. i, part 11, pp. 85-132.

A useful paper including tables of genera and species, and also descriptions of several new forms.

- Brunetti, E.—Notes on Oriental Diptera. Nos. I and II. Ibid., pp. 163-170,

The first part of these notes comprises a list of the oriental species of the important economic group *Diopsinae*. Altogether 12 species of *Diopsis*, 9 of *Telopsis* and 2 *Sphyracephala* are enumerated. Part II. is a preliminary report on a collection of about 130 species of Diptera obtained between April 24th and May 8th, 1907, in the Simla district, at altitudes varying from 5,000 to 8,700 ft. The collection exhibits a marked Palaearctic facies, and considerable proportion of European species, these latter, moreover, retaining for the most part their typical form.

A. D. IMMS.

- Carnes, E. K.—The *Coccidae* of California. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 155-222, pls. ii-v, 34 text figs.

A very useful and interesting paper enumerating 132 species.

- Caudell, A. N.—Notes on some Western Orthoptera; with the description of one New Species. Proc. U.S. Nat. Mus., 1908, vol. xxxiv, pp. 71-81.
- Cépeède, C.—Entretiens sur les Sporozoaires parasites des insectes. Feuille jeun. Nat., 1907 (4) Ann. 37, pp. 62-65, 85-90, 19 figs.
- Felt, E. P.—Observations on the genus *Contarinia*. Journ. Econ. Entom., 1908, vol. i, pp. 225-227.
- Fletcher, T. B.—On the Larva of *Prodenia synstictis*. Spolia Zeylanica, 1908, vol. v, pp. 95-97.
- Franklin, H. J.—On a collection of Thysanopterous Insects from Barbadoes and St. Vincent Islands. Proc. U.S. Nat. Mus., 1908, vol. xxxiii, pp. 715-730, pls. lxiii-lxv.
- Gillette, C. P.—*Aphis gossypii*, Glov., and its Allies. Jour. Econ. Entom., 1908, vol. i, pp. 176-181.
- Headlee, T. J.—Life History of the Striped Cucumber Beetle, with a brief account of some experiments for its control. Journ. Econ. Entom., 1908, vol. i, pp. 203-209.
- Houghton, C. O.—Notes on *Trogoderma tarsale*, Marsh. Journ. Econ. Entom., 1908, vol. i, pp. 216-217.
- Jordan, K. and Rothschild, N. C.—Revision of the Non-combed eyed Siphonaptera. Parasitology, 1908, vol. i, pp. 1-100, pls. i-vii.
- Marlatt, C. L.—The National Collection of *Coccidae*. U.S. Dept. Agric., Bur. of Entom., Tech. Ser. No. 16, Pt. 1., 1908, pp. 1-10.
- Martelli, G.—Note dietologiche sulla mosca delle olive. Boll. Lab. Zool. gen. e agrar. Portici, 1908, vol. ii, pp. 1-12.
- Martelli, G.—Osservazioni sulle Cocciniglie dell' olivo fatte in Puglia e in Calabria. Ibid., pp. 217-296, 22 figs.
- Masi, L.—Sul numero e sulla denominazione dei parassiti della mosca delle olive. Ibid., pp. 185-194, 1 fig.
- Niessen, J.—*Aphis cardui*, L. auf *Oenothera muricata*, L. Marcellia, 1908, vol. vii, p. 14, 2 figs.
- Paiva, C. A.—Records of Hemiptera and Hymenoptera from the Himalayas. Rec. Indian Mus., 1907, vol. i, part i, pp. 13-20.

Comprises a number of species collected during 1905 and 1906 by four or five collectors in various parts of the Himalayas. Exact localities and

approximate altitudes are given, and the list is of importance to students of distribution, dealing as it does with localities up to 11,000 ft.

Pierce, W. D.—Descriptions of new Curculionid Beetles of the Tribe *Anthenomini*. Proc. U.S. Nat. Mus., 1908, vol. xxxiv, pp. 173-181.

Quayle, H. J.—The California Life History of the Grape Leaf-Hopper, *Typhlocyba comae*, Say. Ibid., pp. 182-183, pls., i, ii.

Rübsaamen, E. H.—Beiträge zur Kenntnis Ausserenropäischer Zoocecidien. Marcellia, 1908, vol. vii, pp. 15-79, figs. 8-17.

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Shelford, V. E.—Life-Histories and Larval Habits of Tiger Beetles (*Cicindelidae*). Ibid., pp. 157-184, pls. 23-26.

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Silvestri, F.—Generazione della mosca delle olive. Boll. Lab. Zool. gen. e agrar. Portici, 1908, vol. ii, pp. 13-17.

Silvestri, F.—La tignola dell' olivo. (*Prays oleellus*, Fabr.). Ibid., pp. 83-184, 68 figs.

Silvestri, F., Martelli, G. e Masi, L.—Sugli Imenotteri parassiti ectofagi della mosca delle olive fino ad ora osservati nel l'Italia meridionale. Ibid., pp. 18-82, 36 figs.

Silvestri, F. e Martelli, G.—La Cocciniglia del fico (*Ceroplastes rusci*, L.). Ibid., pp. 297-358, 37 figs.

Silvestri, F.—Materiali per lo studio dei Tisanuri. Ibid., pp. 359-397, xxiv. figs.

Describes and figures 6 new genera, 11 new species, and 2 new varieties.

- Smith, J. B.—Report of the Mosquito Work in 1907. 28th Ann. Rpt., N.J. Agric. Exp. Stat. for 1907, 1908, pp. 479-544, fig. i-xv.
- Warren, W.—Descriptions of New Species of South American Geometrid Moths. Proc. U.S. Nat. Mus., 1908, vol. xxxiv, pp. 91-110.
- Washburn, F. L.—Egg laying of *Empoasca mali*. Journ. Econ. Entom., 1908, vol. i, pp. 142-145, 2 figs.

IV.—AGRICULTURE AND HORTICULTURE.

- Alford, F. C.—Extraction of Beeswax. Colorado Agric. Exp. Stat., Bull. 129, 1908, pp. 3-14.
- Anon.—The Codling-Moth Parasite. *Caliephialtes messer*, Grav. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 231-238, plt. ix.
- Britton, W. E.—Tests of various gases for fumigating nursery trees to destroy San José Scale. Rpt. Conn. Agric. Exp. Stat. for 1907, 1908, pp. 270-282.
- Britton, W. E.—Tests of various gases for Fumigating Nursery Trees. Journ. Econ. Entom., 1908, vol. i, pp. 110-112.
- Britton, W. E. and Walden, B. H.—Spraying Tests with commercial "Soluble Oils" to kill the San José Scale. Ibid., pp. 282-285.
- Chittenden, F. H.—Insects Injurious to the Loco Weeds. U.S. Dept. Agric., Bur. of Entom., Bull. No. 64, Pt. V, 1908, pp. 33-43, figs. 8-14.
- Chittenden, F. H.—The Nut Weevils. U.S. Dept. Agric., Bur. of Entom., Circ. No. 99, 1908, pp. 1-15, 14 figs.
- This useful Circular is a reprint from the Yearbook for 1904, and treats of those species infecting chestnuts, pecan nuts, and hazel nuts.
- Ehrhorn, E. M.—Insects of the year. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 223-230.
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- Forbes, S. A.—Experiments with Repellents against the Corn Root-Aphis. Journ. Econ. Entom., 1908, vol. i, pp. 81-83.
- Gillette, C. P.—The Poplar Bark Aphid, *Schizoneura populi*, n.sp. Entom. News, 1908, vol. xix, pp. 1, 2, 1 plt.

- Gossard, H. A.—The Catalpa Bud Maggot. Journ. Econ. Entom., 1908, vol. 1, pp. 181-182.
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- Halsted, B. D.—Report of the Botanist. 28th Ann. Report. N.J. Agric. Exp. Stat. for 1907, 1908, pp. 257-386, pls. i-xxvii.
- Herrera, A. L.—The Orange Worm (*Trypeta ludens*.) Journ. Econ. Entom., 1908, vol. i, pp. 169-174.
- Jack, R. W.—The Earth Flea [Mite]. Agr. Journ. C. of G. H., 1908, pp. 615-620, 4 figs.
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- Kurosawa, K.—Report on an Experiment in Rearing Silkworms. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 261-270.
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- Lefroy, H. M.—The Tobacco Stem Borer. Agric. Journ. India, 1908, vol. iii, pp. 65-68, plt. xix.
- Lipman, J. G.—Report of the Soil Chemist and Bacteriologist. 28th Ann. Rpt. N.J. Agric. Exp. Stat. for 1907, 1908, pp. 139-204, 3 pls.
- Lounsbury, C. P.—The Smyrna Fig and its Pollinating Insect. Agric. Journ. C. of G. H., 1908, pp. 516-568.
- McIntosh, W. R.—The Economic Value of Wild Birds. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 532-540.
- Mally, C. W.—The Fruit Fly. Paraffin Remedy versus Poisoned Bait. Agric. Journ. C. of G. H., 1908, pp. 609-614.
- Newell, W.—The Early Cotton and Boll Weevil. State Crop Pest Comms. Louisiana, Circ., No. 22, 1908, pp. 1-7.
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- Paine, C. T.—The Peach Blight. (*Coryneum beyerinkii*). 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 239-247.
- Pierce, W. D.—The Economic Bearing of recent studies of the Parasites of Cotton Boll Weevil. Journ. Econ. Entom., 1908, vol. i, pp. 117-122.
- Quaintance, A. L.—The Apple-tree Tent Caterpillar. (*Malacosoma americana*, Fabr.). U.S. Dept. Agric., Bur. of Entom., Circ. No. 98, 1908, pp. 1-8, 4 figs.
- Quaintance, A. L.—The Apple Maggot or "Railroad Worm." (*Rhagoletis* [*Trypeta*] *pomonella*, Walsh.). Ibid., Circ. No. 101, 1908, pp. 1-12, 2 figs.
- Quaintance, A. L.—Demonstration Spraying for the Codling Moth. Ibid., Bull. No. 68, Pt. VII, 1908, pp. 69-76.
- Quayle, H. J.—A new Root Pest of the Vine in California. Journ. Econ. Entom., 1908, vol. i, pp. 175-176.
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- Sanderson, E. D.—Preliminary Report on the Life-history of the Codling Moth and spraying experiments against it. Journ. Econ. Entom., 1908, vol. i, pp. 129-141.
- Smith, J. B.—Report of the Entomologist. 28th Ann. Rpt. N. J. Agric. Exp. Stat. for 1907, 1908. pp. 387-478, pls. 1-3, 1 fig.
- Street, J. P.—The Chemical Composition of Lead Arsenate and Paris Green. Rpt. Conn. Agric. Exp. Stat. for 1907, 1908, pp. 321-330.
- Taylor, E. P.—Life-history notes and control of the Green Peach Aphis, *Myzus persicae*. Journ. Econ. Entom., 1908, vol. i, pp. 83-91.
- Waite, M. B.—Progress of Pear Blight Control in California. 2nd Rpt. Comms. Hort. Calif. for 1905-6, 1907, pp. 426-432.
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Washburn, F. L.—The so-called "Green Bug" and other Grain Aphids in Minnesota in 1907. Agric. Exp. Stat. Minnesota, Bull. No. 108, 1908, pp. 257-280, 1 plt. and 15 figs.

Walden, B. H.—The Peach Sawfly (*Pamphilus persicum*, Mac. G.) Rpt. Conn. Agric. Exp. Stat. for 1907, 1908, pp. 285-300, pls. i-vi.

V.—FORESTRY.

Gillanders, A. T.—Forest Entomology. Pp. xxii + 422 and 351 figs. Edinburgh and London: William Blackwood & Sons, 1908. Price 15s. net.

We extend a hearty welcome to Mr. Gillanders' new work, which is well printed and very fully illustrated.

The volume opens with an introduction treating of the general structure and classification of insects which might have been amplified with profit. This is followed by a somewhat imperfect account of the Gall-mites (*Eriophyidae*), in which the absence of any reference to Mr. Gussow's and Dr. Nalepa's work on *E. rudis* is to be regretted.

Chapters 2 and 3 deal with the Coleoptera, and in our opinion are the best in the book. The figures are excellent and the descriptions concise, clear, and practical. The next two chapters are allotted to the Hymenoptera, a single one each to Coccidae, Lepidoptera, Aphididae, Diptera, and Psyllidae and Cicadidae.

The concluding chapters treat of collecting and preserving insects; insecticides and general remedies; beneficial insects; and a list of species and their food plants.

We must confess that we read the "Contents" with some surprise. Under the words Forest Entomology the author has included the *Eriophyidae* or Gall-Mites, and whilst classification will always be more or less arbitrary, that chosen by Mr. Gillanders is the strangest.

The omission of the common names of the various insects in not a few cases is a matter for regret, whilst a fuller acquaintance with the literature on Economic Entomology detracts in many cases from the value of the work.

Yet in spite of these minor blemishes the book is sound and certainly the best account of forest insects yet given by any British author, and we congratulate Mr. Gillanders on a piece of work well and ably carried out.

W. E. C.

VI.—FISHERIES.

Nelson, J.—Report of the Biologist. Observations on the Fixation of Oyster Spat at Barnegat, N.J., 1907. 28th Ann. Rpt. N.J. Agric. Exp. Stat. for 1907, 1908, pp. 205-256, pls. i-xiii.

Shipley, A. E.—*Echinorhynchus* causing disease in Trout. Field, 1908 (June 27th), p. 1101.

VII.—MEDICINE.

Bruce David.—The Extinction of Malta Fever. Nature, 1908 (May 14), pp. 39-42, 7 figs.

VIII.—ANIMAL DISEASES.

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Janin, F.—Researches with the Sarcosporidia of the Sheep. Journ. Trop. Vet. Sci., 1908, vol. iii, pp. 36-70, plt. xiii, and 2 figs.
Translated from the *Archives de Parasitologie*, T. xi, No. 2.

Montgomery, R. E.—On a Spirochaete occurring in the Blood of Chickens in Northern India. Journ. Trop. Vet. Sci., 1908, vol. iii, pp. 1-12, pls. i, ii.

Newell, W. and Mauldin, C. E.—Report upon the Eradication of the Cattle Tick in Lincoln and Claiborne Parishes. State Crop Pest Comms. of Louisiana, Circ. No. 21, 1908, pp. 1-4.

- Robertson, W.**—A Disease of Fowls simulating in some respects Fowl Cholera. *Agric. Journ. C. of G.H.*, 1908, pp. 577-579, 5 figs.
- Warburton, C.**—The Ticks infesting Domesticated Animals in India. *Imp. Dept. Agric. India, Bull. No. 6*, 1907, pp. 1-13, 15 figs.
- Fuller, Claude.**—Ticks and East Coast Fever. *Natal Agric. Journ.*, 1908, vol. xi, pp. 427-429.
- Watkins-Pitchford, H.**—Report on the Sheep Disease known as "Blue-tongue." *Ibid.*, pp. 543-549.
- Bevan, L. E. W.**—A Specific Lung Disease of Calves. *Rhodesian Agric. Journ.*, 1908, vol. v, pp. 399-410.

